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THE GENESIS OF CONSCIOUSNESS.

IT is often forgotten that the basis on which modern theories rest is narrower than that of their predecessors. Adam Smith did not think of himself as an economist but as a philosopher. So did Locke and Hume. Even John Stuart Mill spent as much time on psychology as he did on economic discussions. His *Political Economy* was an accident due to his failure to find a basis for a study of character. Utilitarianism, associational psychology, classical economics, and English philosophy have the same roots and the same background. The separation came through the failure of these disciplines to meet the conditions set by evolutionary theories. They went down to be revived again under new names by men who no longer thought of themselves as philosophers but as workers in science. Yet the new is merely the old order under modern titles. William James says pragmatism is a new name for an old philosophy. He is right, for Locke and Adam Smith were pragmatists even if they did not have the word.

To-day we think of behavior psychology as something new; yet it is merely a clearer statement of problems which earlier writers tried to solve by cruder methods. There is little difference in saying with Locke that the mind is blank, and in saying with the behavior school of psychologists that the content of consciousness should be ignored. Both schools agree that the sources of action are outside of consciousness. Both view human nature as the behavior of men seen in their daily life. This has become the economic interpretation of history if measured in its effect on masses and epochs. It is behavior psychology if tested by the reactions of individuals. It is Freudian psychology if sex impulse is emphasized. It is biology if human nature is broadened enough to include problems of heredity. All these sources make contributions to the new view, and only by their revaluation on some common ground can the unity be restored which gave force to the philosophy of the last century.

The older psychology was a soul philosophy in whose terms all was explained. In the transition from it to nerve psychology it was assumed that the nerve did what the soul was supposed to do and in a similar manner. For every soul function a nerve was sought which performed mechanically what the soul was thought to do. Old concepts were thus retained under new names which could not stand an examination on their own ground. Psychology can free itself from the resulting confusion only by ceasing its endeavor to make nerve action correspond to the predicates of soul supremacy and by putting in their place known facts as exemplified in bodily activity. We should study nerves in their objective manifestation as behavior before we try to observe their effects on consciousness. What the body nerves do brain nerves also do but nothing more. If there is a discrepancy between these known powers and those manifested in our conscious life we should attribute the difference to some other force or to some complexity not yet understood. This method does not invalidate either what we know of nerves or of consciousness. It merely warns us against hasty identification and slipshod methods of passing from one to the other.

To understand our bodies we should start from the simple functions of assimilation, circulation, and muscular activity. These form a kinetic system composed of autonomous organs which generates energy. By it food is acquired, digested, circulated, and discharged. In contrast to it is a system of control by which external adjustment is wrought. The latter is the central nervous system through whose development life is preserved and activity encouraged. The nerve is not the source of energy, nor does it have any but a subordinate place in the vital organs upon which life depends. We should start, therefore, not with a study of nerves but with an examination of the autonomic system which it controls but does not make. Digestion, circulation, and muscular activity still take place according to methods older than the nervous system. We must shut from view the action of the central nervous system to see what the kinetic system can do and how it does it. Its movements are always of a tropic nature. Heat, light, and gravitation are the first controllers of action, and the type of action is either that of advance or retreat. Next in order is the influence of surplus and deficit. As soon as organisms can store energy they can be aroused to activity by internal stimuli, and with further development these internal states become more effective than the external ones resulting from light and heat.

At a higher level we find organisms with a better developed muscular and circulatory system. Their striking characteristic is the symmetrical development of opposing parts. We can almost say of the higher types that they are two organisms, each side being practically a duplicate of the other. The result is rhythmic action, each part ceasing to act while its opposite discharges its energy. This rhythmic action is not different from the tropic action of simple organisms. It is merely excited in a different way. The animal has lost the control exercised by external agents such as heat and light, and their place is supplied by the states of the blood. When the blood was cold, a mere reflection of external temperature, external forces aroused activity. Now hot blood can stimulate activity and thus energize parts by its presence or check action by its absence. Surplus and deficit thus become the determiners of action. Blood flows to one side, accumulates a surplus and discharges; while it is inactive the other side functions in a like manner. When the central nervous system begins to play its part it alters the flow of blood and checks the rhythmic action characteristic of the kinetic system.

If we judge animals by their behavior, evidence of the existence of a central nervous system is shown in persistent action and in attention. The rhythmic action of the kinetic system is changed into monistic action. Movements are continued even when they are painful. On the other hand, parts with a surplus have their activity checked with a resulting accumulation of surplus which vainly endeavors to discharge itself. The net result of this abnormal situation—parts pained by a deficit and parts overloaded with a repressed surplus—is a better adjustment due to nerve control; but we should not forget the cost in the abnormalities it creates. To this struggle our emotions are due. Consciousness is an attempt of the ultimate life forces to escape domination and not any evolution of their master, the central nervous system. If a break can be made from a lower to a higher realm the dominance of the nerve can be replaced by the dominance of the blood, through which comes a reinstatement of the ultimate life forces in their original position of power. The nerve becomes a servant, not a master. Adjustment yields to the sweep of inborn activities. Our goal is no longer to attain the objective but to voice the subjective.

This seems an impossible task with the tools at hand, yet if we look in the right quarter the road is simplicity itself. The characteristic expression of nerve action is persistence and attention. Measure these in terms of muscle and we have strain. Parts are kept active after their supply of energy is so low as to cause pain. Strain also starts the activity of adjacent muscles by an overflow of energy. Nerve action overdoes itself by exciting more movement than is needed for the desired effect. If we raise the leg we also set the jaw and swing the arm. A series of overflow movements is excited by each nervous strain. Take off the strain and a release of energy follows in the repressed parts. Thus strains and releases are the new alternates, each in turn affecting not one part but many parts. One group of movements is induced by strains and another by the release of suppressed energy which follows the strain.

With these facts as a background the problems of consciousness can be faced. Consciousness is an illumination, a transformation of energy from motion to light. Energy and light have the same antecedents, and from one to the other transformations can be made. Consciousness starts with an overflow of energy due to strain meeting some resistance which intensifies its effect. An electrical current transforms energy into light when it is forced to pass over a slender wire. If we repress bodily energy and let it escape under restricted conditions we produce organically what the electric current does mechanically. This is what strain, repression, and release do if their relation is such as I have described. Nervous control causes an overflow of energy and its repression at other points. The release and escape transform energy into an illumination. Consciousness in its earliest form is thus an overflow of energy due to strain and a release of energy which follows strain. Either of these would produce the desired transformation of muscular energy into light while both together would tend to make the illumination permanent. Such a transformation may be readily observed in the case of fireflies. The movement of the wings is accompanied by the radiation of light. The escape of energy in this case produces an external effect. Change the escaping flow from the body to the brain and an elementary form of consciousness would result.

I want to repeat this thought so essential to my position. Can an energy strain be transformed into a color scale? Is the background of consciousness a change of color and shade, or does a series of ideas flow through consciousness in an immaterial chain? When we repress ideas, do we shove some entity into a subconscious cavern or do we extinguish the color form by which they are recognized? As we decide these questions we determine the form of psychology we accept, and also determine the relative parts which blood and nerve play in the formation of ideas. The problem is: Will a strain produce a mental illumination causing it to be recognized in consciousness not as effort but as form? Do we see something when we strain, and if so, what? My reply would be that blood pulses create the illumination which underlies consciousness and that they are intensified by any strain directing energy into particular channels and repressing it in others. The same localization of energy occurs in the physical background of consciousness as occurs in the strained part of the body. Parts of the field of consciousness are darkened by a deficit of blood and other parts have an increased illumination due to augmented blood pressure. The field of consciousness thus presents a figure which is light or dark, simple or complex, wavy or fixed, as the underlying strains change in their intensity. We thus have a color scale which reflects bodily conditions and through which they may be interpreted.

When in the dark I lie with my eyes closed the changing blood pressure often creates distinct figures. If these slight alterations in pressure are capable of an interpretation it is easy to see how bodily strains can produce more intense effects. Strong contractions in one muscle certainly create an overflow of energy which contracts other muscles. If so, it must derange the circulation in other parts of the body and thus affect the blood pulses of the brain. The rhythmic contraction of related parts causing this condition makes it possible to judge of bodily stresses by the resulting mental picture.

An illumination of this sort would have no adjustive value. It would be merely an escape of surplus energy as is the illumination due to the movement of a firefly. But we should remember that conscious illumination is complex due to the relation of strain and release. It is, therefore, never complete. Some parts of the field of consciousness are illuminated by the release, while other parts are darkened by the strain. Each specific content of consciousness has for this reason a form and these forms are capable of an interpretation. By these forms activity can be judged, and through them we gain the basis of our logical judgments.

The dominance of strain gives one form, the dominance of release gives another. We thus have two forms with every nervous restraint; A as it produces strain, and B in the subsequent release. If the net result of strain and release is organically favorable, we identify A and B and think of the two as interchangeable. A is B and B is A. This is the logical basis of substitution, and it happens wherever A or B are the index of favorable organic effects. But when the effect of strain and release is organically antagonistic we set A and B over against each other and call them opposites. From this tendency we get the basis of our moral judgments. We then pronounce the action which caused the strain to be bad, or we seek to restore harmony by some suppression of the release. In either case we acquire the concept of the good and bad and build emotions which help us gain the good and remove the bad. Love and hate rise in consciousness as soon as antagonism due to strain and release appear. From them comes the concept of free association due to the repeated substitution of similars and the concept of antagonism upon which elimination depends. Hence arise the three elements of conscious thought — illumination, form, and interpretation. With their aid the gap between the physical and the mental can be spanned.

To understand this process we must realize how color and form are interpreted in the ordinary experience of men. The illumination varies from an almost complete field of bright color to a repression leaving only dark lines visible in consciousness. Strain always exerts some influence and thus the illumination is not complete. The nearest to it is the presence of lines or spots in the illuminated field, and then the associated concept is that of a face. The man in the moon is an example of primitive association. Increase the suppression of light, and at the other end of the scale we have wavy lines which are interpreted as snakes and other loathsome creatures. These variations I shall call the chromatic scale. From the resulting combinations all initial interpretations are derived. At the top of the scale, where the illumination is full, the association is with the sun, the creator, the hero, and those concepts out of which arises our ideal of perfection. Less complete, the association is sexual. Any intense figure enclosing dark spots or lines brings to the woman the concept of a man and to the man a like concept of a woman. Still lower on the scale, where the edge becomes wavy, we seem either to be moving through the air and then the bird concept arises, or something comes to take us away, and then we think of a horse. If the illumination is still more obscure we seem unable to move, and the form is that of a bear; while still lower, being conscious only of wavy lines, we are filled with horror at our helplessness and interpret moving objects as hideous reptiles.

These figures in turn arouse tropic movements. An intense light excites a forward movement while a dim light provokes a retreat. The bright we call the good; the dark excites fear; while wavy lines are interpreted as movement. All the primary impulses can thus be excited and an interpretation made in terms of the external world. We read the scale and act on it instead of waiting for the direct action of the external world on our bodily organs. Our movements are excited no longer by heat and cold but by forms projected into consciousness by the chromatic scale. Sense-perceptions are reactions which throw color images into consciousness and then move muscles in harmony with the interpreted forms. Color and form are intermediates between two systems each of which were once independent in their action. It is thus that a few primary impulses get organized so that they perform the functions demanded by a complex adjustment Not a single function is added. The mechanisms of simpler organisms merely show themselves in new combinations.

Such a picture, however satisfactory, does not account for the thought-processes of men as contrasted with their impulsive reactions. There is as great a need of control over visual impulses as over bodily movements. This need the central nervous system supplies by the same means as it controls bodily movements. If persistence is the measure of nervous control of bodily action, attention is its mark in conscious acts. Attention is a mental strain of the same nature as bodily strains. It consists in keeping the flow of thought confined to a single object when, if controlled by impulse, thought would be a series of substitutions. Each thought would then be interpreted in terms of some other thought. This new thought would be put in place of its predecessor, to be displaced in turn by that concept through which it is interpreted. Such a series is a free association, the most familiar form of which is a dream. Attention disturbs this flow of free association and puts in its place the fixed series which we call the logical. To be logical, thought must flow in a fixed groove created by the strain of attention. Grooved thought is the series which leads to survival and hence we call it the truth. True thoughts thus correspond to the flow of objective impressions and lead to the repression of the internal flow of free associations. The believer in truth rejects as false all this internal flow of free associations, shuts it out of his consciousness and builds his scheme of thought only on impressions received from the external world. He does this by means of repressions through which the natural sequence of free association is prevented. There are also groups of compulsions, by which I mean that with given ideas other ideas arise in consciousness and retain a fixed order. These suppressions and compulsions are never complete. The actual thought of man is a combination of antagonistic elements each of which in striving for the mastery forces its opponent into distorted forms. The opposition we cannot prevent, but the bad effects might be obviated by a better understanding of the process by which it is promoted.

This analysis of thought appears strange, but it is not so different from the traditional analysis as at first sight may seem. The fundamental contrast is new, but, when made, the secondary divisions can be readily made to correspond to those now in use. In its origin thought is partly internal and partly external. Internal thought is a process, a constant shifting from one concept to another, the underlying principle being that of substitution. External thought is compulsive. It may fade, but it never changes. When a concept returns it has exactly the same form as before and the same accompaniments. These are impressments if they arise from the action of the senses, or compulsions if they result from strains due to the antecedent action of the nervous system. Impressments and compulsions are unchangeable elements which we can analyze but never transform. They become parts of thought-processes and thus create thought movement only as we substitute for them some concept of internal origin. Through this substitution chains of reasoning are started which flow along a natural channel unless some nervous repression alters their course. Natural thought is a shifting from concept to concept, the new being a substitute for the old. Reasoning of this sort has as premises either impressments or compulsions; then begins a series of substitutions out of which we draw a conclusion. The intermediate steps we may change, but the original premise stands firmly above criticism because it is an impressment or a compulsion and thus beyond the power of conscious thought to alter. When tested by their origins we find that the impressments stand but the compulsions crumble. They are neither a reflection of nature nor a part of our heredity. When they are excluded, thought rests exclusively on sense impressments and on the free associations due to the process of substitution. Impressions are unalterable and uncombinable. The unity we give them comes from no affinity they have for each other, but through the mental compulsions which have their origin in strains. In our free thought-processes impressments enter only through substitutions. They are thus transformed from isolated facts into the mass-formations which free association is capable of making. Attention, which is nervous, analyzes and isolates. Association compounds. These are our only thought-processes; through them thought sinks to mathematical points or rises to mass infinity. The one is the dominant tendency in science; the other gives zest to the flights of the imagination.

Such is the process of thought in its primary terms. To make it correspond to the full consciousness of adult life we must show its application to the combinations of ideas we call memory. As an element in consciousness, memory is a series of associated ideas which differs from free associations in that the order is fixed. Free association is a shifting from one vivid idea to another, the basis of the shifting being the yearning for wish-fulfilment. Memory does not follow this order because the flow of thought is cramped by repressions which force it to move in fixed grooves. Thoughts which hinder adjustment are repressed, while those are intensified which reflect external conditions. Memory is thought moving through or controlled by nervous tracts and reactions. The thought which follows each presented concept is that which excites a nervous reaction and not that which the process of free association would provoke. Memory is thus a series of nervous reactions and not a series of free associations. The nervous reaction is the connecting link between ideas and not the rhythm of blood and muscle which lies back of free associations.

This analysis is readily transformed into the terms of psychology. Writers of long ago discovered that associations were resolvable into three groups, contiguity, similarity, and contrast. This grouping suffices for a mere classification but is no aid in the search for origins. The antecedents of contiguous associations are nervous. The contiguous is that which arises through the nervous reaction which an object excites. Contiguous associations are a series of impressments and not a series of substitutions. Such thought is mechanical but not rational. It is only the two other types of association, similarity and contrast, which are in any true sense associations. They form a process which takes place within consciousness and each is necessary for the other. Substitution acts through the blood and muscular rhythm it excites, and not through the nervous reaction. If we had no related organs which reciprocally act we could have no process of substitution and hence no way of arriving at the thought of similarity and contrast. Association is the interpretation of one object through some other which follows it in the rhythm of activity and replacement. There is a strain, a discharge, and then a rest during which time the activity is transferred to the reciprocal part. Two organs thus take a part in each substitution, the repetition of which creates the series of free associations. We see an object, we think of its name which is its recognition as a sound; then the associated sound is reflected back into the field of vision and there arises in a form related to the sound which was its antecedent. Each series of associated ideas takes a definite path fixed by the associations which arise with each new transfer. Word associations, as the process continues, grow in clearness while visual associations grow more intense. We thus attain a union of clearness and vividness which no process of impressment could attain. The order of these ideas is not that of the external world nor that imposed by the nerves. Free associations move toward a goal set by internal impulse and not toward that imposed by our nervous reactions.

The nerves thus play the same part in thought as they do in bodily control. No one assumes that bodily energy comes from the nerves. It is plainly a rhythmic flow exciting in turn each of two symmetrical parts. Any sudden shock, the stubbing of a toe, a sound, a sight, or the feeling of pain starts a nervous reaction which injects a foreign element in the series and forces action into a new channel. All shocks are injects which disturb rhythmic movement of symmetrical parts. This makes the difference between the rhythmic flow of energy induced by the muscular activity, and the reactions which the nervous system is capable of exciting. These nervous injects are the ultimate premises from which we reason as to ends. The nervous inject is a substitution of a higher value than the thought which its rise suppresses. Let us assume that in a natural series the conclusion is reached that the eating of pork is injurious. If instead of saying this it is affirmed that God prohibits the use of pork, the concept of God is substituted for the evidence about pork-eating. By this means antagonism to pork-eating gains a vividness which the injury of pork-eating could not evoke. This vivid concept of God is a nervous inject which we must explain through some antecedent shock which suppresses the natural flow of thought. All moral laws arise in this way. They substitute nervous shocks of high adjustive value for the crude flow of internal thought. Reality thinking is thus an injection of a nervous reaction as initial point of a new thought-series. When reasoning deductively we say, "It is either A or B." We do not decide in favor of A by means of direct evidence. We say, "It is A because it is not B." It is thus the aversion to B and not the proof of A which determines the decision. The aversion to B is a nervous inject due to antecedent experience. It represents a repression the source of which we may be unconscious of but which has been repeated often enough to be the cause of a nervous reaction. The repressed, however, is not what we hate but what we love. It is a wish, a yearning, reflecting our natural self. But when its presence excites a nervous reaction we substitute for our emotion of love the acuter pain which the nervous reaction evokes. A love is thus changed into a phobia, and the censor instead of being avoided has its power strengthened.

Here is an example from personal experience. I was discussing with a friend the utility of certain beliefs. He was much wrought up at my position and finally expressed his emotion in this form: "If I believed as you do and had only one year to live I would indulge in every sensation that Broadway affords, getting the most possible out of the year." This was put forward as a convincing argument;

but it revealed more of his interior than he was aware. A description of his family will show the content of his inner self. His father was known to have broken every commandment but the eighth, and his brother lived so fast that he died before thirty. His mother was a saintly woman, a lady bountiful who put many an ill-gotten dollar to good use. My friend had an intense love for his mother and accepted all her compulsions as divine commands. His life was as pure as hers, but he had his father's heredity. This was voiced in his denunciation for all his father did, but this denunciation was also an outlet for the pent-up emotions which he inherited but never gratified. It is plain that the intense expressions he used to me were the reflection of his day-dreaming. He would like to be bad but dared not. His expressed thought was thus turned into a form which strengthened the censor instead of thwarting it. The nervous complexes formed in this way lead to superstition through their vagueness and to dogmatism through their cohesion. The purification of thought does not come through them but through free associations. We thus reach the source of mental activity by a route which makes no demand for elements not found in the simple organisms. The blood pulses are strong but fickle. The nerve mechanisms are steady and coordinated. The net result is a series of revolutions due to temporary pulses outwitted by the better organized nerves. Adjustment thus dominates over internal impulses creating an approach to rational conduct.

With this analysis of the elements of consciousness as a basis the new thought can be readily related to older philosophies. The limitations placed on the sensory functions make the part they play in the formation of ideas resemble that given to the sensory powers by the transcendental philosophers. The senses can present; the central nervous system can control; but beyond this neither can go. Some other course must be sought for the processes by which thought can rise to the level we know it is capable of attaining. In so much the transcendentalists were right. They could challenge their opponents' position and win a negative victory. But on the positive side they failed because they sought to find for thought some super-sensory origin instead of looking for a pre-sensory origin. The from-within elements of consciousness are older than the from-without. Life was blind before the rise of the nervous system, but though subordinated its ultimates still persist. The path of progress consists in freeing the elemental life pulses from the distortion which ages of adjustment have imposed. The within must impress itself on the without instead of the without distorting and suppressing what it has not the power to change.

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